

Application No.: 09/707,269

Case No.: 53415US038

(c) a passivating agent (page 24, lines 10-24).

The liquid is substantially free of loose abrasive particles (page 25, lines 8-12). See claim 1.

§ 103 Rejections

Claims 16-35 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hudson (US 5,972,792) in view of Kaufman, et al. (US 5,954,997). However, on page 2 of the Office Action dated January 9, 2003, the Examiner stated that: "Kaufman could stand alone as a reference, as Kaufman teaches the solution comprising the three components without particles (col. 9, lines 39-43)."

Applicants submit that Kaufman teaches a chemical mechanical polishing slurry including a complexing agent, at least one oxidizer, at least one abrasive, and a film forming agent. (See, col. 1, lines 8-10; and col. 4, lines 58-60.) However, Kaufman fails to teach or suggest a solution comprising the three components without particles.

Kaufman teaches that "[e]lectrochemical tests are used to evaluate CMP mechanisms and to provide guidance in selection of slurry components." (Col. 9, lines 33-35, emphasis added.) Kaufman evaluated the electrode potential and the metal dissolution rate of copper with and without surface abrasion. (See, col. 9, lines 39-61.) The solutions tested by Kaufman were:

- (1) 4 weight % ammonium persulfate with 1 weight % glycine (col. 9, lines 45-50);
- (2) 4 weight % ammonium persulfate with 1 weight % ammonium oxalate (col. 9, lines 45-50);
- (3) 11% hydrogen peroxide (col. 9, lines 66-67);
- (4) 11% hydrogen peroxide with 1 weight % glycine (col. 9, lines 66-67); and
- (5) 11% hydrogen peroxide with 1 weight % ammonium oxalate (col. 9, lines 66 – col. 10, line 1).

Kaufman describes ammonium persulfate and ammonium peroxide as "oxidizers" (col. 9, line 45-47; and lines 65-67) and ammonium oxalate as a "complexing agent" (col. 6, lines 3-9). As noted in the present application, glycine may be used as a complexing agent (page 22, lines 28-29.)

Thus, at most, Kaufman discloses that an "oxidizer" and a "complexing agent" may be useful as slurry components. Kaufman does not disclose a solution comprising an oxidizing

Application No.: 09/707,269

Case No.: 53415US038

agent; a complexing agent; and a passivating agent that is substantially free of loose abrasive particles, as claimed in the present invention.

Kaufman states that the "additions of small amounts of BTA [benzotriazole] assure that the passivation should occur promptly." (Col. 10, lines 7-10, emphasis added.) BTA is "a film forming agent" that facilitates "the formation of a passivating layer." (Col. 5, lines 44-49.) However, the only solutions disclosed by Kaufman that contain BTA also contain abrasive particles. (See, col. 2, lines 16-67; and Table 1A.)

Thus, although Kaufman discloses solutions consisting of an oxidizer and a film forming agent, and slurries comprising an abrasive, an oxidizer, a complexing agent, and a film forming agent, neither of these solutions anticipates the present invention – a working liquid that is substantially free of loose abrasive particles comprising an oxidizing agent, a complexing agent, and a passivating agent.

Furthermore, Kaufman standing alone as a reference fails to render the present invention obvious. Although Kaufman discloses evaluating slurry components in the absence of abrasive particles (see, col. 9, line 34 – col. 10, line 7), Kaufman only teaches or suggests polishing slurries that contain abrasive particles (see, e.g., col. 1, lines 8-10; col. 4, lines 58 – col. 5, line 5; and col. 7, line 1- col. 8, line 21.)

Claims 16-35 stand rejected under 35 U.S.C. § 103(a) as being unpatenable over Hudson (US 5,972,792) in view of Kaufman, et al. (US 5,954,997).

Applicants submit that Hudson teaches a method for planarizing a surface layer on a semiconductor wafer or other substrate. The method uses a fixed-abrasive polishing pad with an abrasive-free planarizing solution that oxidizes and/or roughens the material of the surface. (See, col. 3, lines 25-32.) Hudson discloses different polarizing solutions for use with different substrates, each having preferred pH ranges and oxidants. (See, col. 4, lines 34-65.)

For planarizing tungsten, Hudson teaches that the pH should be below 5.0 and the oxidant may be potassium iodate. Hudson discloses that such a solution may be obtained by removing the abrasive particles from a commercially available slurry (QCTT1011-14B from Rodel Corporation.) (See, col. 4, lines 34-49.) Hudson does not teach or suggest that the removal of the abrasive particles from any commercially available slurry would result in a useful polishing solution for

Application No.: 09/707,269

Case No.: 53415US038

fixed abrasive articles. Rather, Hudson teaches that the removal of the abrasive particles from one commercially available slurry resulted in a solution useful for polishing tungsten.

Hudson also teaches a variety of solutions for polishing copper. However, Hudson fails to teach or suggest a single solution containing an oxidizing agent, a complexing agent and a passivating agent. Hudson also discloses that, when polishing copper, the pH of the solution should be less than 2.5 or more than 10.5. (See, col. 4, lines 56-65.) Kaufman teaches solutions containing abrasive particles with an oxidizing agent, a complexing agent and a passivating agent, which are used to polish copper. However, each of these solutions had a pH ranging from 7.2 to 7.8. (See, col. 10, lines 24-50.) As discussed, Hudson teaches away from the use of such a polishing solution for copper, as Hudson teaches that the pH should be less than 2.5 or more than 10.5.

Thus, absent the teaching of the present application, the requisite motivation to remove the abrasive particles from the solutions disclosed by Kaufman for use in the method taught by Hudson is not present.

For at least these reasons, the rejection of claims 16-35 under 35 U.S.C. § 103(a) as being unpatentable over Hudson in view of Kaufman et al. has been overcome and should be withdrawn.

In view of the above, it is submitted that the application is in condition for allowance. Reconsideration of the application is requested.

Allowance of claims 16-35 at an early date is solicited.

30 May 2003
Date

Respectfully submitted,

By: 

Scott A. Bardell, Reg. No.: 39,594

Telephone No.: 651-736-6935

Office of Intellectual Property Counsel
3M Innovative Properties Company
Facsimile No.: 651-736-3833

FAX RECEIVED

MAY 30 2003

TECHNOLOGY CENTER 2800